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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/562,528

12/28/2005

Xue-Jan Fan

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03/25/2009

PHILIPS INTELLECTUAL PROPERTY & STANDARDS

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BRIARCLIFF MANOR, NY 10510

EXAMINER

SMITH, COURTNEY L

ART UNIT

PAPER NUMBER

2835

MAIL DATE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/562,528	Applicant(s) FAN ET AL.	
	Examiner COURTNEY SMITH	Art Unit 2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1, 7, 12-13, and 21-22**, are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)**.

Regarding Claims 1, 12-13 Hagerup discloses a device (**Fig. 4**) for thermal management of an integrated circuit device (**24**), the device comprising: a heat sink (**30**); a substrate (**14**) overlying the heat sink; a trace layer (**26**) overlying and adjacent the substrate; a pad (**where 22 is adjacent and overlies the trace layer**) overlying and adjacent to the trace layer, the pad being operable to mount the IC; and a via (**40**) extending through the substrate, wherein the via is in thermal communication with the trace layer and the heat sink to transfer to the heat sink at least a portion of any heat applied to the trace layer by the semiconductor. **Except, Hagerup** does not explicitly disclose the circuit device is an LED. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to modify the thermal management device of Hagerup with an LED rather than an integrated circuit chip since it was known in the art that both components are semiconductor devices that produce heat.

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Regarding Claim 7, Hagerup discloses a device (**Fig. 4**) of claim 1, wherein the substrate is a flexible substrate (**wherein the disclosed LTCC tape is flexible, as disclosed in Col. 1, lines 40-49**).

Claims 21-22, Hagerup discloses a device (**Fig. 6**) of claim 1, **except** explicitly disclosing the via includes: a copper sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink, a thermal conductive material filling and/or solder at least a portion of the channel; and the thermal conductive material is different from the material of the sidewall. However, **Nakamura** discloses a copper sidewall (**copper foil--5a-fig. 2**) defining a channel (**5**) through the substrate (**2**), the channel interfacing with the trace layer (**2a, 2b**) to thereby establish the thermal communication between the via, trace layer, and heat sink (**4**), a thermal conductive material filling and/or solder at least a portion of the channel (**Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder since 3a/3b are solder to the circuit board 2, and Col. 3, lines 24-29 also discloses how heat is thus radiated via through hole 5 and 3a/3b, and Col. 5, lines 56-58 further disclosed 3a and 3b are commonly formed with 5, and thus constitutes at least a portion of the channel**); and the thermal conductive material is different from the material of the sidewall (**as already set forth, whereby the sidewall is portion 5a**). It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the via of Nakamura in order

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to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

3. **Claim 6**, is rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** as applied to claim 1 above, in view of **(Washburn 5,064,673)**.

Regarding Claim 6, Hagerup discloses a device **(Fig. 4)** of claim 1, **except** explicitly wherein the substrate is a printed circuit board. However, **Washburn** explicitly discloses a substrate is a printed circuit board **(as set forth by Col. 1, lines 30-34)**. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Hagerup with the substrate of Washburn for a more improved fabrication of electrical connections via trace layers of the printed circuit board between discrete electrical components as opposed to trimming and shaping wire bonded leads etc. **Note: (Background of Invention of Hagerup discloses Washburn 5,604,673 (although, not incorporated explicitly as a reference).**

4. **Claims 2-5**, are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Hagerup 6,477,054)** in view of **(Weber 6,226,183)**.

Regarding Claims 2-4, Hagerup discloses a device **(Fig. 4)** of claim 1, **except** explicitly further comprising: a bonding layer between the substrate and the heat sink. However, **Weber** discloses a bonding layer is a thermally conductive adhesive and/or tape **(7-Fig. 2; Col. 2, lines 16-20; where adhesive and/or adhesive foil constitutes**

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adhesive and/or tape). It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the thermal management device of Hagerup with the thermally conductive adhesive/tape of Weber for a more improved heat transfer from the substrate for heat radiation by the heat sink.

Regarding Claim 5, Hagerup discloses a device (**Fig. 4**) of claim 2, wherein the substrate is a multi-layered substrate (**as disclosed by Col. 4, lines 62-67**).

5. **Claims 8-11, 14-17**, are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hagerup 6,477,054**) as applied to claim 1 above in view of (**Nakamura 7,054,159**).

Claims 8-11, 14-17, Hagerup discloses a device (**Fig. 6**) of claim 1, **except** explicitly disclosing the via includes: a sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink and a thermal conductive material filling at least a portion of the channel. However, **Nakamura** discloses a sidewall (**copper foil-- 5a-fig. 2**) defining a channel (**5**) through the substrate (**2**), the channel interfacing with the trace layer (**2a, 2b**) to thereby establish the thermal communication between the via, trace layer, and heat sink (**4**) and a thermal conductive material filling at least a portion of the channel (**Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder, since 3a/3b are soldered to the circuit board 2, and Col. 3, lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b**). It would have been obvious to one having ordinary skill in the art at the time

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that the invention was made to provide the device of Hagerup with the via of Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board.

6. **Claim 18-20**, are rejected under 35 U.S.C. 103(a) as being unpatentable over **(Weber 6,226,183)**.in view of **(Nakamura 7,054,159)**.

Regarding Claims 18-19, **Weber** discloses a device **(Fig. 2)** for thermal management of a semiconductor device **(3)**, the device comprising: a heat sink **(1)**; a substrate **(2)** overlying the heat sink, a trace layer **(10)** overlying the substrate; and a via **(4)**. **Except Weber** does not explicitly disclose the semiconductor device is an LED; nor does **Weber** disclose the via includes: a sidewall defining a channel through the substrate, the channel interfacing with the trace layer to thereby establish the thermal communication between the via, trace layer and heat sink and a thermal conductive material filling at least a portion of the channel. However, **Nakamura** discloses a sidewall **(copper foil--5a-fig. 2)** including defining a channel **(5)** through the substrate **(2)**, the channel interfacing with the trace layer **(2a, 2b)** to thereby establish the thermal communication between the via, trace layer, and heat sink **(4)** and a thermal conductive material filling at least a portion of the channel **(Col. 2, lines 45-64; wherein at least a portion of the channel comprises solder, since 3a/3b are soldered to the circuit board 2, and Col. 3, lines 24-29 further discloses how heat is thus radiated via through hole 5 and 3a/3b)**. It would have been obvious to one having ordinary skill in the art at the time that the invention was made to provide the device of Weber with the

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via of Nakamura in order to increase the surface area of the via; wherein allowing for more effective heat transfer and bypassing the circuit board. It would have been further obvious to one having ordinary skill in the art at the time that the invention was made to modify the thermal management device of Weber with a LED rather than a semiconductor device since it was known in the art that both components are semiconductor devices that produce heat.

Regarding Claim 20, Weber discloses a device (**Fig. 2**) of claim 18, further comprising: a bonding layer (**adhesive or adhesive foil---7-Fig. 2; Col. 2, lines 16-20**) between the substrate and the heat sink.

Response to Arguments

7. Applicant's arguments with respect to claims 1, 6-17, and 21-22 have been considered but are not persuasive. **Regarding Claims 1, 12;** the applicant argues that Hagerup does not disclose “a pad overlying and adjacent to the trace layer, and operable to mount the LED since there is a dielectric layer between the pad and trace layer”. The Examiner respectfully disagrees. It is to be noted, as rejected above; a pad 22 overlies and is adjacent to the trace layer 26. The Examiner further notes that the applicant does not assert or disclose the features to exclude any intervening layers, or only ‘*consist*’ of the features, but rather asserts the device ‘*comprises*’ the claimed element; the device neither associates any specific functional characteristics of the pad

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that may not be accomplished by the prior art and therefore the instant application is not distinguishable over Hagerup. **Regarding Claim 12;** the applicant recites a previous argument of a 'flexible substrate' and attempts to negate the Examiner's definition of flexible: 'capable of being flexed' as set forth by Merriam Webster's dictionary, by further emphasizing that flexible may also be defined as 'supple and pliable'. It is to be noted that the layers of flexible tape as disclosed by Hagerup is capable of being flexed, and that the fact that the tape may undergo a process of firing does not change the capability of the tape to be flexed. The Examiner further notes that the process of manufacturing the device does not distinguish the prior art from the instant application, and thus the applicant should assert distinguishing materials that may constitute flexibility, since a flexible substrate sets forth language that is so broad it may even be interpreted that the substrate is flexible in design and may constructed in various ways with different electrical patterns etc..

8. Applicant's arguments with respect to claims **2-5, and 18-20** have been considered but are moot in view of the new ground(s) of rejection. The applicant has submitted an affidavit to overcome the Mazzochette reference, and thus the Examiner has made a new rejection modifying Weber with Nakumura.

9. Applicant's arguments with respect to claims **21-22** have been considered but are not persuasive. The applicant argues that Nakamura does not disclose 'a thermal conductive material filling/solder at least a portion of the channel'. The Examiner respectfully disagrees. It is to be noted that the above rejection sets forth the thermal

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filling /solder, and Col. 5, lines 56-58 further discloses 3a and 3b are commonly formed with channel 5, and thus constitutes at least a portion of the channel.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Courtney L. Smith whose telephone number is 571-272-9094. The examiner can normally be reached on Monday-Friday 7:30a-5p (1st Fri. off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jayprakash Gandhi can be reached on 571-272-3740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C. L. S./

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/Jayprakash N Gandhi/

Supervisory Patent Examiner, Art Unit 2835